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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/785,396	02/23/2004	Walter D. Mieher	KLA1P117X1A/P1151 CIP1	6516

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EXAMINER	
STOCK JR, GORDON J	

ART UNIT	PAPER NUMBER
2877	

MAIL DATE	DELIVERY MODE
10/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/785,396	MIEHER ET AL.	
	Examiner	Art Unit	
	Gordon J. Stock	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 September 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16,19,20,22-30 and 38-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,6-16,19,25,29, 30 and 38-40* is/are rejected.

7)☒ Claim(s) *3-5,20,22-24 and 26-28* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *13 September 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *20070913*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The Amendment received on September 13, 2007 has been entered into the record.

Information Disclosure Statement

2. The information disclosure statement (IDS) submitted on September 13, 2007 has been considered by the examiner.

Drawings

3. The Drawings received on September 13, 2007 are accepted by the Examiner.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. **Claims 1, 2, 6, 10, 12-16, 38-40** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Yang et al. (6,982,793)-previously cited** in view of **Sezginer et al. (2005/0012928).**

As for **claims 1 and 38**, Yang in a method and apparatus for using an alignment target with designed in offset discloses the following: providing targets A, B, C, D that each include a portion of the first and second structures on a first and second layer of a sample (Fig. 15: 252, 254, 256, 258); wherein the target A (Fig. 15: 252) is designed to have a predefined offset, D, between its first and second structures portions (Fig. 15: 252, D); wherein the target B (Fig. 15: 254) is designed to have a predefined offset, -D, between its first and second structures portions (Fig. 15: 254, -D); wherein the target C (Fig. 15: 256) is designed to have a predefined offset, D + d, between its first and second structures portions (Fig. 15: 256, D + d); wherein the target D, (Fig. 15: 258) is designed to have a predefined offset, -D-d, between its first and second structures portions (Fig. 15: 258, -D-d); illuminating the targets A, B, C, and D with EM radiation to obtain spectra Sa, Sb, Sc, and Sd from targets A-D respectively using an imaging optical system (col. 16, lines 38-40; Fig. 26a, col. 17, lines 1-20); determining any overlay error between the first structures and the second structures using linear approximation based on the obtained spectra, a linear based technique (Fig. 16: equation 8; col. 16, lines 40-50); a scatterometry module for illuminating the targets thereby a scatterometry overlay technique is used (Fig. 12c: 145; col. 11, lines 50-55; col. 12, lines 20-35); a processor operable for analyzing optical signals, spectra, for determining any overlay error (Fig. 12c: 147 and 148) that uses a scatterometry technique (col. 12, lines 20-35); wherein, line images are formed (Fig. 26b from Fig. 26a).

Yang does not teach the scatterometry overlay technique is a phase based technique that includes representing each of the measured signals as a set of periodic functions having a plurality of known parameters and an unknown overlay error parameter and analyzing the set of

periodic functions to solve for the unknown overlay error parameter to thereby determine the overlay error. However, Sezginer in a method of measuring overlay error does teach the particular phase based technique (paragraphs 0118-0120). Because both the Yang reference and the Sezginer reference teach methods of scatterometrically measuring overlay error of targets with predefined offsets, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the linear based technique for the phase based technique to achieve the predictable result of determining overlay error.

As for **claim 2,** Yang in view of Sezginer discloses everything as above (see **claim 1**). In addition, Yang discloses illumination and a lens (Fig. 26a: 804 and 810). Yang does not explicitly state the illumination and the numerical aperture of the lens are configured to ensure that only zeroth diffraction order is collected. However, the system is a normal incidence reflectometer (Fig. 26a: illuminating normal to the plane of the target), and Yang discloses normal incidence and detection of diffracting light reflected from target (col. 12, lines 5-30). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have the lens numerical aperture and the illumination at an optimal value to ensure that the normal incidence reflectometer system captures solely the zeroth order diffracted light, light reflecting off of the surface normal to incident surface, for greater signal to noise from eliminating non-normal reflected, higher order diffraction orders, from entering the detector.

As for **claim 6**, Yang in view of Sezginer discloses everything as above (see **claim 2**). In addition, Yang discloses that a plurality of discrete wavelengths may be used (col. 10, lines 55-60) and that wavelengths may be varied (col. 15, lines 40-45). Yang does not explicitly state adjusting a wavelength selection device. However, it would be obvious to one of ordinary skill

in the art at the time the invention was made to adjust a wavelength selection device in order to vary the wavelengths and to measure at a plurality of discrete wavelengths.

As for **claim 10**, Yang in view of Sezginer discloses everything as above (see **claim 6**). Yang is silent concerning a polarizer and an analyzer in the collection path (Fig. 26a). Yang does teach an analyzer and polarizer in a scatterometer and reflectometer (Figs. 12b and 12c). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have an analyzer and polarizer in order to image two targets simultaneously for ellipsometric measurements.

As for **claim 12**, Yang in view of Sezginer discloses everything as above (see **claim 2**). In addition, Yang discloses the measured optical signals are in the form of one or more images (Fig. 26b).

As for **claim 13**, Yang in view of Sezginer discloses everything as above (see **claim 12**). In addition, Yang discloses that the images include center portions of each target and the image center portion of each target is analyzed (Fig. 26a: 802a, 802b; and suggested by imaging of targets of Fig. 24).

As for **claim 14**, Yang in view of Sezginer discloses everything as above (see **claim 2**). In addition, Yang discloses that the overlay error is determined without comparing any of the measured optical signals to a known or reference signal from a sample target having a known overlay error (col. 16, lines 50-60).

As for **claim 15**, Yang in view of Sezginer discloses everything as above (see **claim 2**). In addition, Yang discloses each first structure has a first center of symmetry and each second structure has a second center of symmetry; wherein, the first center of symmetry and the second

center of symmetry for each target are offset with respect to each other by a selected one of the predefined offsets (Fig. 24: 700, 702, 704).

As for **claim 16**, Yang in view of Sezginer discloses everything as above (see **claim 2**). In addition, Yang discloses determining the overlay error without comparing the optical signals to calibration data (col. 16, lines 50-60).

As for **claim 39**, Yang in view of Sezginer discloses everything as above (see **claim 38**). In addition, Yang discloses each first structure has a first center of symmetry and each second structure has a second center of symmetry; wherein, the first center of symmetry and the second center of symmetry for each target are offset with respect to each other by a selected one of the predefined offsets (Fig. 24: 700, 702, 704).

As for **claim 40**, Yang in view of Sezginer discloses everything as above (see **claim 38**). In addition, Yang discloses determining the overlay error without comparing the optical signals to calibration data (col. 16, lines 50-60).

7. **Claims 7 and 8** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Yang et al. (6,982,793)—previously cited** in view of **Sezginer et al. (2005/0012928)** further in view of **Shiraishi et al. (5,966,201)-previously cited.**

As for **claims 7 and 8**, Yang in view of Sezginer discloses everything as above (see **claim 6**). Yang is silent concerning a set of band pass interference filters in the path of the illumination source. However, Shiraishi in a mark position detection system teaches having an interference filter in the illumination path for wavelength selection of 550 to 750 nm (col. 8, lines 35-45). Yang discloses wavelength ranges from at least 500 to 700nm (Fig. 4). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have a

set of interference filters in the illumination path in order to adjust to discrete wavelengths within the range of 500 to 700 nm.

8. **Claims 7, 9, 19, 29-30** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Yang et al. (6,982,793)-previously cited** in view of **Sezginer et al. (2005/0012928)** in view of **Johnson et al. (5,388,909)-previously cited.**

As for **claims 7 and 9**, Yang in view of Sezginer discloses everything as above (see **claim 6**). Yang is silent concerning a set of band pass interference filters in the path of the illumination source. However, Johnson in a substrate inspection system teaches using a series of interference filters in front of a detector (col. 7, lines 1-10). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to have a set of interference filters in front of the detector in order to measure at discrete wavelengths within a range of wavelengths.

As for **claim 19**, Yang in view of Sezginer discloses everything as above (see **claim 1**). In addition, Yang discloses a broadband source (Fig. 26a: 804); a detector for detecting a measured signal (Fig. 26a: 816); wherein using the imaging optical system includes at least one radiation beam towards each target to measure a plurality of measured signals from the periodic targets (Fig. 26a: 802a, 802b). Yang is silent concerning a filter and adjusting the filter to pass particular wavelengths. However, Yang discloses that a plurality of discrete wavelengths may be used (col. 10, lines 55-60) and that wavelengths may be varied (col. 15, lines 40-45). And Johnson in a substrate inspection system teaches using a series of interference filters in front of a detector (col. 7, lines 1-10). Therefore, it would be obvious to one of ordinary skill in the art at

the time the invention was made to have a set of interference filters in front of the detector in order to adjust wavelengths to measure at discrete wavelengths within a range of wavelengths.

As for **claim 29**, Yang in view of Sezginer and Johnson discloses everything as above (see **claim 19**). In addition, Yang discloses each first structure has a first center of symmetry and each second structure has a second center of symmetry; wherein, the first center of symmetry and the second center of symmetry for each target are offset with respect to each other by a selected one of the predefined offsets (Fig. 24: 700, 702, 704).

As for **claim 30**, Yang in view of Sezginer and Johnson discloses everything as above (see **claim 19**). In addition, Yang discloses determining the overlay error without comparing the optical signals to calibration data (col. 16, lines 50-60).

9. **Claim 11** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Yang et al. (6,982,793)-previously cited** in view of **Sezginer et al. (2005/0012928)** further in view of **Hignette et al. (5,191,393)-previously cited.**

As for **claim 11**, Yang in view of Sezginer discloses everything as above (see **claim 2**). Yang is silent concerning using a Fourier transform. However, Hignette in an overlay measurement device teaches using a Fourier transform to determine overlay (col. 2, lines 65-67; col. 3, lines 1-5). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to use a Fourier transform in order to measure the amount of overlay inaccuracy.

10. **Claim 25** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Yang et al. (6,982,793)-previously cited** in view of **Sezginer et al. (2005/0012928)** in view of **Johnson et al. (5,388,909)-previously cited** further in view of **Stirton (6,458,605).**

As for **claim 25**, Yang in view of Sezginer and Johnson discloses everything as above (see claim 19). In addition, Yang discloses repeating the using the optical system step using a plurality of wavelengths (as demonstrated in Figs. 6-11). Yang is silent concerning using a weighted average of the measured optical signals to determine overlay error. However, Stirton in a system for controlling overlay teaches using weighted averaging of optical signals to determine overlay error (col. 12, lines 5-30). Therefore, it would be obvious to one of ordinary skill in the art at the time the invention was made to use a weighted average to determine overlay error in order to have a more accurate overlay error.

Allowable Subject Matter

11. **Claims 3-5 and 20, 22-24, 26-28** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to **claim 3**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining an overlay error the particular condition being met by the imaging optical system, in combination with the rest of the limitations of **claim 3.**

As to **claim 4**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining an overlay error the particular condition being met by the imaging optical system, in combination with the rest of the limitations of **claims 4-5.**

As to **claim 20**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining an overlay error the particular obtaining an intensity and combining steps, in combination with the rest of the limitations of **claims 20, 22-23, 26-28.**

As to **claim 24**, the prior art of record, taken alone or in combination, fails to disclose or render obvious in a method for determining an overlay error having the largest contrast being used to determine overlay error, in combination with the rest of the limitations of **claim 24.**

Response to Arguments

12. Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection. As for the previously mentioned allowable subject matter (see Action: 20070606), the Examiner apologizes for the inconvenience but upon further search and consideration a new rejection has been made under 35 U.S.C. 103(a).

Terminal Disclaimer

13. The terminal disclaimers filed on September 13, 2007 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of **10/785,395 and 10/785,723** have been reviewed and is accepted. The terminal disclaimer have been recorded.

Fax/Telephone Numbers

If the applicant wishes to send a fax dealing with either a proposed amendment or a discussion with a phone interview, then the fax should:

1) Contain either a statement "DRAFT" or "PROPOSED AMENDMENT" on the fax cover sheet; and

2) Should be unsigned by the attorney or agent.

This will ensure that it will not be entered into the case and will be forwarded to the examiner as quickly as possible.

Papers related to the application may be submitted to Group 2800 by Fax transmission. Papers should be faxed to Group 2800 via the PTO Fax machine located in Crystal Plaza 4. The

form of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The CP4 Fax Machine number is: **(571) 273-8300**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gordon J. Stock whose telephone number is (571) 272-2431. The examiner can normally be reached on Monday-Friday, 10:00 a.m. - 6:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr., can be reached at 571-272-2800 ext 77.

Information regarding the status of an application may be obtained from the Patent Application lnformation Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private Pair system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

gs
October 9, 2007

Gregory J. Toatley, Jr.
Supervisory Patent Examiner
Art Unit 2877